

allowing the heat to transfer from the one or more heaters to a part of the formation;
wherein the part of the formation has been selected for heating using a total organic matter weight percentage of at least a portion of the part of the formation, and wherein at least the portion of the part of the formation comprises a total organic matter weight percentage of at least about 5.0 %; and
producing a mixture from the formation.

1730. (amended) The method of claim 1727, wherein at least one of the one or more heaters comprises an electrical heater.

1731. (amended) The method of claim 1727, wherein at least one of the one or more heaters comprises a surface burner.

1732. (amended) The method of claim 1727, wherein at least one of the one or more heaters comprises a flameless distributed combustor.

1733. (amended) The method of claim 1727, wherein at least one of the one or more heaters comprises a natural distributed combustor.

1738. (amended) The method of claim 1727, wherein allowing the heat to transfer to the part of the formation heats the part of the formation to increase a thermal conductivity of at least a portion of the part of the formation to greater than about 0.5 W/(m °C).

1760. (amended) The method of claim 1727, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation to greater than about 100 millidarcy.

1761. (amended) The method of claim 1727, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

1766. (amended) A method of treating a hydrocarbon containing formation in situ, comprising:

providing heat from one or more heaters positioned in heater wells to at least a portion of the formation;

allowing the heat to transfer from the one or more heaters to a part of the formation;

wherein at least some hydrocarbons within the part of the formation have an initial total organic matter weight percentage of at least about 5.0%; and

producing a mixture from the formation.

1769. (amended) The method of claim 1766, wherein at least one of the one or more heaters comprises an electrical heater.

1770. (amended) The method of claim 1766, wherein at least one of the one or more heaters comprises a surface burner.

1771. (amended) The method of claim 1766, wherein at least one of the one or more heaters comprises a flameless distributed combustor.

1772. (amended) The method of claim 1766, wherein at least one of the one or more heaters comprises a natural distributed combustor.

1777. (amended) The method of claim 1766, wherein allowing the heat to transfer to the part of the formation heats the part of the formation to increase a thermal conductivity of at least a portion of the part of the formation to greater than about 0.5 W/(m °C).

1799. (amended) The method of claim 1766, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation to greater than about 100 millidarcy.

1800. (amended) The method of claim 1766, wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.

Response to Final Office Action Mailed December 11, 2002

A. Pending Claims

Claims 1727-1804, 5396, and 5397 are pending in the case. Claims 1727, 1730-1733, 1738, 1760, 1761, 1766, 1769-1772, 1777, 1799, and 1800 have been amended.

B. Provisional Double Patenting Rejection

The Examiner provisionally rejected claims 1727-1804, 5396, and 5397 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending U.S. Patent Application Nos.:

09/840,936; 09/840,937; 09/841,000; 09/841,060; 09/841,061; 09/841,127;
09/841,128; 09/841,129; 09/841,130; 09/841,131; 09/841,170; 09/841,193;
09/841,194; 09/841,195; 09/841,238; 09/841,239; 09/841,240; 09/841,283;
09/841,284; 09/841,285; 09/841,286; 09/841,288; 09/841,289; 09/841,290;
09/841,291; 09/841,292; 09/841,293; 09/841,294; 09/841,295; 09/841,296;
09/841,297; 09/841,298; 09/841,299; 09/841,300; 09/841,301; 09/841,302;
09/841,303; 09/841,304; 09/841,305; 09/841,306; 09/841,307; 09/841,308;
09/841,309; 09/841,310; 09/841,311; 09/841,312; 09/841,429; 09/841,430;
09/841,431; 09/841,432; 09/841,433; 09/841,434; 09/841,435; 09/841,436;
09/841,437; 09/841,438; 09/841,439; 09/841,440; 09/841,441; 09/841,442;
09/841,443; 09/841,444; 09/841,445; 09/841,446; 09/841,447; 09/841,448;
09/841,449; 09/841,488; 09/841,489; 09/841,490; 09/841,491; 09/841,492;
09/841,493; 09/841,494; 09/841,495; 09/841,496; 09/841,497; 09/841,498;
09/841,499; 09/841,500; 09/841,501; 09/841,502; 09/841,632; 09/841,633;
09/841,634; 09/841,635; 09/841,636; 09/841,637; 09/841,638; and 09/841,639.

Applicant respectfully traverses the provisional double patenting rejection. Applicant respectfully submits that the omnibus nature of this rejection does not provide Applicant with sufficient detail in which to address such rejection. Applicant also respectfully submits that the rejection is also inconsistent with certain restrictions issued in the above-referenced cases. Applicant respectfully requests reconsideration.

Pursuant to discussion with the Examiner, for the convenience of the Examiner, Applicant will forward copies of allowed claims for the above-referenced cases to the Examiner's Supervisor. Applicant understands that the Examiner's Supervisor will review the allowed claims for the above-referenced cases and then reconsider the double patenting rejection in view of such allowed claims.

C. The Claims Are Not Anticipated By Tsai et al. Pursuant To 35 U.S.C. § 102(b)

The Examiner rejected claims 1727, 1729, 1732, 1733, 1737, 1753, 1760-1762, 1766, 1768, 1771, 1776, 1792, and 1799-1801 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 4,299,285 to Tsai et al. (hereinafter "Tsai"). Applicant respectfully disagrees with these rejections.

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed.Cir. 1986); *In re Donahue*, 766 F.2d 531, 226 U.S.P.Q. 619, 621 (Fed.Cir. 1985).

Amended claim 1727 describes a combination of features including: "providing heat from one or more heaters positioned in heater wells to at least a portion of the formation...." Amended claim 1766 describes a combination of features including: "providing heat from one or more heaters positioned in heater wells to at least a portion of the formation...." Support for amendments to the claims is found in the Specification at least on page 40, lines 6-11. The above-quoted features, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Tsai discloses: "the oxidizing gas is injected into the injection hole at an appropriate rate and the fire is started in the coal bed at the injection well." (Tsai, col. 2, lines 30-33) Applicant respectfully submits that Tsai does not appear to teach or suggest providing heat from one or more heaters positioned in heater wells to a part of the formation. Applicant respectfully

requests removal of the obviousness rejection of claims 1727 and 1766, and the claims dependent thereon.

Applicant submits that many of the claims dependent on claims 1727 and 1766 are separately patentable.

Claims 1729 and 1768 describe a combination of features including: "maintaining a temperature within the part of the formation within a pyrolysis temperature range from about 270 °C to about 400 °C." Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Amended claims 1732 and 1771 describe features including: "wherein at least one of the one or more heaters comprises a flameless distributed combustor." The Examiner states: "With regards to claim 1732; the Tsai reference teaches a flameless combustor (see col. 2, line 32)." The Examiner further states: "With regards to claim 1771; the Tsai reference teaches a flameless combustor (see col. 2., line 32)."

Applicant's specification teaches, in reference to flameless combustion:

Flameless combustion may be accomplished by preheating a fuel and combustion air to a temperature above an auto-ignition temperature of the mixture. The fuel and combustion air may be mixed in a heating zone to combust. In the heating zone of the flameless combustor, a catalytic surface may be provided to lower the auto-ignition temperature of the fuel and air mixture. (Specification, page 4, lines 2-6)

Applicant's specification also teaches:

FIG. 28 illustrates an embodiment of a flameless combustor configured to heat a section of the hydrocarbon containing formation. (Specification, page 119, lines 7-8)

Oxidation of fuel fluid 621 may provide heat generation within outer conduit 636. The generated heat may provide heat to at least a portion of a hydrocarbon containing formation proximate to the oxidation region of inner

conduit 638. Products 625 from oxidation of fuel fluid 621 may be removed through outer conduit 636 outside inner conduit 638. (Specification, page 119, line 28 to page 120, line 2)

Amended claims 1733 and 1772 describe features including: “wherein at least one of the one or more heaters comprises a natural distributed combustor.” The Examiner states: “With regards to claim 1733; the Tsai reference teaches a natural distributed combustor (see col. 2, line 32).” The Examiner further states: “With regards to claim 1772; the Tsai reference teaches a natural distributed combustor (see col. 2, line 32).”

Applicant’s specification teaches, in reference to a natural distributed combustor:

As used herein, the phrase “natural distributed combustor” generally refers to a heater that uses an oxidant to oxidize at least a portion of the carbon in the formation to generate heat, and wherein the oxidation takes place in a vicinity proximate to a wellbore. Most of the combustion products produced in the natural distributed combustor are removed through the wellbore. (Specification, page 40, lines 19-24)

Although the heat from the oxidation is transferred to the formation, oxidation product 519 (and excess oxidation fluid such as air) may be substantially inhibited from flowing through the formation and/or to a production well within formation 516. Instead oxidation product 519 (and excess oxidation fluid) is removed (e.g., through a conduit such as conduit 512) as is described herein. In this manner, heat is transferred to the formation from the oxidation but exposure of the pyrolysis zone with oxidation product 519 and/or oxidation fluid may be substantially inhibited and/or prevented. (Specification, page 77, lines 18-24)

Tsai does not appear to teach a heater such as a natural distributed combustor or a flameless combustor. Tsai appears to teach starting a fire in the coal bed. Tsai states, “the oxidizing gas is injected into the injection hole at an appropriate rate and the fire is started in the coal bed at the injection well.” (Tsai, col. 2, lines 31-34)

Applicant submits that the combination of the features in claims 1732, 1733, 1771, and 1772 do not appear to be taught or suggested by the cited art.

Claims 1737 and 1776 describe a combination of features including: “wherein allowing

the heat to transfer comprises transferring heat substantially by conduction.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1753 and 1792 describe a combination of features including: “controlling a pressure within at least a majority of the part of the formation, wherein the controlled pressure is at least about 2.0 bars absolute.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Amended claims 1760 and 1799 describe a combination of features including: “wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation to greater than about 100 millidarcy.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Amended claims 1761 and 1800 describe a combination of features including: “wherein allowing the heat to transfer increases a permeability of a majority of the part of the formation such that the permeability of the majority of the part is substantially uniform.”

Permeabilities recorded in Table I of Tsai do not appear to be substantially uniform. Tsai states: “The initial permeability of the core was 2.0, after two days it was 27.5, after three days it was 77.2 and after four days it was 107 as reported in Table I.” (Tsai, col. 7, lines 11-14) In addition, Table I of Tsai discloses a permeability of 107 md for Ex. 6 and a permeability of 148 md for Ex. 7, in which the axis of the core was perpendicular to the bedding plane. Tsai does not appear to teach or suggest at least the above-quoted features of the claims. Applicant submits at least the above-quoted features of claims 1761 and 1800, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1762 and 1801 describe a combination of features including: “controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by

the Fischer Assay.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

D. The Claims Are Not Obvious Over Tsai Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1728, 1730, 1731, 1738-1750, 1754, 1755, 1767, 1769, 1770, 1777-1789, 1793, and 1794 under 35 U.S.C. § 103(a) as being unpatentable over Tsai. Applicant respectfully disagrees with these rejections.

In order to reject a claim as obvious, the Examiner has the burden of establishing a *prima facie* case of obviousness. *In re Warner et al.*, 379 F.2d 1011, 154 USPQ 173, 177-178 (CCPA 1967). To establish a *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP § 2143.03.

If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). For at least the reasons cited above, independent claims 1727 and 1766 are not obvious over the cited art. Furthermore, applicant submits that many of the claims dependent on claims 1727 and 1766 may be separately patentable.

For example, amended claims 1730 and 1769 describe a combination of features including: “wherein at least one of the one or more heaters comprises an electrical heater.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Amended claims 1731 and 1770 describe a combination of features including: “wherein at least one of the one or more heaters comprises a surface burner.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Amended claims 1738 and 1777 describe a combination of features including: “wherein allowing the heat to transfer to the part of the formation heats the part of the formation to increase a thermal conductivity of at least a portion of the part of the formation to greater than about 0.5 W/(m °C).” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

E. The Claims Are Not Obvious Over Tsai In View of Elkins Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1734 and 1773 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of U.S. Patent No. 2,734,579 to Elkins (hereinafter “Elkins”). Applicant respectfully disagrees with these rejections.

Claims 1734 and 1773 describe a combination of features including: “controlling a pressure and a temperature within at least a majority of the part of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

F. The Claims Are Not Obvious Over Tsai In View Of Kasevich et al. Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1735, 1736, 1774, and 1775 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of U.S. Patent No. 4,457,365 to Kasevich et al. (hereinafter “Kasevich”). Applicant respectfully disagrees with these rejections.

Claims 1735 and 1774 describe a combination of features including: “controlling the heat such that an average heating rate of the part of the formation is less than about 1 °C per day during pyrolysis within a pyrolysis temperature range of about 270 °C to about 400 °C.”

Claims 1736 and 1775 describe a combination of features including: “wherein heating energy/day (P_{wr}) provided to the selected volume is equal to or less than $h \cdot V \cdot C_v \cdot \rho_B$; wherein ρ_B is an average formation bulk density, and wherein an average heating rate (h) of the selected volume is about 10 °C/day.”

Kasevich states: “this invention provides for heating kerogen in oil shale with electric fields having frequency components in the range between 100 kilohertz and 100 megahertz where dry oil shale is selectively heated, with kerogen-rich regions absorbing energy from said fields at substantially higher rates than kerogen-lean regions.” (Kasevich, col. 2, lines 9-15)

Tsai states: “This invention relates to the in situ combustion and gasification of a swelling bituminous coal by the injection of air for combustion into the coal bed from one or more injection holes and the production of a combustible gas from one or more production holes.” (Tsai, col. 1, lines 6-10)

Obviousness can only be established by “showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teaching of the references.” *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988). Applicant respectfully submits that the features of the electric field heating method of Kasevich for an oil shale formation would not be suitable for modifying the in situ combustion process of Tsai for a coal formation to produce the features described in claims 1735, 1736, 1774, and 1775.

G. The Claims Are Not Obvious Over Tsai In View of Stoddard et al. Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1751, 1752, 1790, and 1791 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of U.S. Patent No. 4,463,807 to Stoddard et al. (hereinafter “Stoddard”). Applicant respectfully disagrees with these rejections.

Claims 1751 and 1790 describe a combination of features including: “wherein the

produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1752 and 1791 describe a combination of features including: “wherein the produced mixture comprises ammonia, and wherein the ammonia is used produce fertilizer.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

H. The Claims Are Not Obvious Over Tsai In View of Gregoli et al. Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1756-1759 and 1795-1798 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of U.S. Patent No. 6,016,867 to Gregoli et al. (hereinafter “Gregoli”). Applicant respectfully disagrees with these rejections.

Claims 1756 and 1795 describe a combination of features including: “altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1757 and 1796 describe a combination of features including: “controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1758 and 1797 describe a combination of features including: “providing hydrogen (H₂) to the part of the formation to hydrogenate hydrocarbons within the part of the formation; and heating a portion of the part of the formation with heat from hydrogenation.”

Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1759 and 1798 describe a combination of features including: “producing hydrogen and condensable hydrocarbons from the formation; and hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.”

Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

I. The Claims Are Not Obvious Over Tsai In View of Van Meurs et al. Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1763, 1764, 1802, 1803, 5396, and 5397 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of U.S. Patent No. 4,886,118 to Van Meurs et al. (hereinafter “Van Meurs”). Applicant respectfully disagrees with these rejections.

Claims 1763 and 1802 describe a combination of features including: “wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heaters are disposed in the formation for each production well.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 1764 and 1803 describe a combination of features including: “providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are located in the formation in a unit of heaters, and wherein the unit of heaters comprises a triangular pattern.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

Claims 5396 and 5397 describe a combination of features including: “wherein at least about 20 heaters are disposed in the formation for each production well.” Applicant submits at

least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

J. The Claims Are Not Obvious Over Tsai In View of Van Meurs And In Further View of Salomonsson Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 1765 and 1804 under 35 U.S.C. § 103(a) as being unpatentable over Tsai in view of Van Meurs and in further view of U.S. Patent No. 2,914,309 to Salomonsson (hereinafter “Salomonsson”). Applicant respectfully disagrees with these rejections.

Claims 1765 and 1804 describe a combination of features including: “providing heat from three or more heaters to at least a portion of the formation, wherein three or more of the heaters are located in the formation in a unit of heaters, wherein the unit of heaters comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.” Applicant submits at least the above-quoted features of the claims, in combination with other features of the claims, do not appear to be taught or suggested by the cited art.

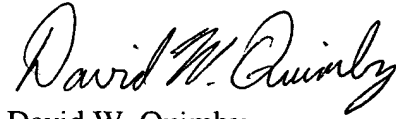
K. Summary

Applicant submits that all claims are in condition for allowance. Favorable consideration is respectfully requested.

It is believed that no fees are due in association with the filing of this and accompanying documents. If any extension of time is required, Applicant hereby requests the appropriate extension of time. If any fees are required, please charge those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5659-03800/EBM.

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